

Atty. Docket No. KOV-012  
Serial No: 10/749,876

Amendments to the Claims

Please amend the claims as follows:

1. (Currently Amended) A radiation patternable functional material, comprising:
  - a) nanoparticles of an electronically functional substance selected from the group consisting of semiconductors and metals; and
  - b) a plurality of ligands bound to each of said nanoparticles, said ligands containing a photoreactive group or a group that is reactive with a photochemically generated species and that, after first-order photoreaction or reacting with said photochemically generated species, materially changes the solubility characteristics of said material in a developer,  
wherein, after irradiation, developing and curing, the functional material forms a patterned film of an electronically conducting or semiconducting material.
2. (Currently Amended) The material of Claim 1, wherein said electronically functional substance nanoparticles comprise[[s]] a member of the group consisting of semiconductors, metals, dielectrics passivated nanoparticles and phosphors nanoparticles containing ligands not having a (photo)reactive group bound thereto.
3. (Currently Amended) The material of Claim 12, wherein said electronically functional substance comprises a member of the group consisting of semiconductors and metals that absorbs a first wavelength of UV light.
4. (Currently Amended) The material of Claim 13, wherein said electronically functional substance comprises one or more members of the group consisting of silicon, germanium, CdS, CdSe, InP, InAs and GaAs.
5. (Original) The material of Claim 4, wherein said electronically functional substance comprises silicon.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

6. (Currently Amended) The material of Claim 13, wherein said electronically functional substance comprises one or more members of the group consisting of transition metals, noble metals, aluminum, indium, tin, lead, and alloys thereof.
7. (Original) The material of Claim 6, wherein said electronically functional substance comprises one or more members of the group consisting of Cr, Mo, W, Fe, Ru, Ni, Pd, Pt, copper, silver, gold, and aluminum.
8. (Original) The material of Claim 7, wherein said electronically functional substance comprises nickel, copper, silver or gold.
9. (Currently Amended) The material of Claim 32, wherein said electronically functional substance comprises an oxide, nitride, oxynitride, carbide or sulfide of a metal or metalloid photoreactive group or group that is reactive with said photochemically generated species absorbs a second wavelength of UV light significantly different from said first wavelength of UV light.
10. (Original) The material of Claim 1, wherein said ligands contain a group that is reactive with said photochemically generated species and that, after reacting with said photochemically generated species, materially changes the solubility characteristics of said material in said developer.
11. (Original) The material of Claim 10, wherein said photoreactive group comprises a quinone, and said ligand comprises a phenol.
12. (Original) The material of Claim 1, wherein said ligands are bound to said nanoparticles by covalent, coordination and/or ionic bonds.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

13. (Original) The material of Claim 12, wherein said ligands are bound to said nanoparticles through at least one nanoparticle-binding member selected from the group consisting of an alcoholate, a thiolate, a disulfide, a carboxylate, a carboxylic acid, an amine, a phosphine, a phosphine oxide and an alkyl group.
14. (Original) The material of Claim 1, wherein said group that is reactive with said photochemically generated species is selected from the group consisting of a carbon-carbon double bond, an epoxide, an oxirane, an aziridine, a phenol, a carbonate and a carbamate.
15. (Original) The material of Claim 14, wherein said group that is reactive with said photochemically generated species comprises said carbon-carbon double bond, and said carbon-carbon double bond is selected from the group consisting of a vinyl group, an activated carbon-carbon double bond, an acrylate, and a vinyl ketone.
16. (Original) The material of Claim 1, wherein said nanoparticles have an average diameter of less than 100 nm.
17. (Original) The material of Claim 1, wherein said nanoparticles have an average diameter of less than 10 nm.
18. (Original) The material of Claim 1, wherein said nanoparticles have an average diameter of less than 5 nm.
19. (Original) The material of Claim 1, wherein said photochemically generated species has an ultraviolet absorption maximum at a first wavelength and said nanoparticles have an ultraviolet absorption maximum at a second wavelength, said second wavelength significantly differing from said first wavelength.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

20. (Original) The material of Claim 19, wherein said photoreactive group comprises an azide, said first wavelength is one at which a mercury arc lamp has a relatively strong irradiance, and said nanoparticles comprise a metal having a relatively poor absorbance at said first wavelength.
21. (Currently Amended; Withdrawn) A The material of Claim 1, comprising a compound of the formula (1):



where NP comprises a said nanoparticle of an said electronically functional substance; Y is a said group that is photoreactive or that is reactive with a said photochemically generated species ~~and which, after first order photoreaction or reacting with said photochemically generated species, materially changes the solubility characteristics of said compound in a developer;~~ X<sup>1</sup> and X<sup>2</sup> are independently a nanoparticle-binding group; R<sup>1</sup> is a monovalent group that is not reactive with said photochemically generated species; R<sup>2</sup> is a divalent bridging group; m is at least 0, and the m instances of R<sup>1</sup>-X<sup>1</sup> may be the same or different; and n is at least 1, and the n instances of X<sup>2</sup>-R<sup>2</sup>-Y may be the same or different; and m + n is at least 2.

22. (Currently Amended; Withdrawn) The compound material of Claim 321, wherein said electronically functional substance nanoparticles comprise[[s]] a member of the group consisting of semiconductors passivated nanoparticles and metals nanoparticles containing ligands not having a (photo)reactive group bound thereto.
23. (Currently Amended; Withdrawn) The compound material of Claim 22, wherein said electronically functional substance consists essentially of silicon and/or germanium.
24. (Currently Amended; Withdrawn) The compound material of Claim 22, wherein said electronically functional substance comprises one or more members of the group

Atty. Docket No. KOV-012  
Serial No: 10/749,876

consisting of transition metals, noble metals, aluminum, indium, tin, lead, and alloys thereof.

25. (Currently Amended; Withdrawn) The ~~compound~~ material of Claim 24, wherein said electronically functional substance consists essentially of nickel, copper, silver or gold.

26. (Currently Amended; Withdrawn) The ~~compound~~ of material Claim 22, wherein said electronically functional substance comprises an oxide, nitride, oxynitride, carbide or sulfide of a metal or metalloid.

27. (Currently Amended; Withdrawn) The ~~compound~~ material of Claim 21, wherein R<sup>1</sup> is alkyl, cycloalkyl, aryl or aralkyl, any one of which may be substituted one or more times with a halogen or with a substituent selected from the group consisting of alkyl (except where R<sup>1</sup> = alkyl), cycloalkyl, aryl, aralkyl (except where R<sup>1</sup> = alkyl), alkoxy, alkylthio, alkylcarbonyl, alkoxy carbonyl, alkylcarboxy, alkylamino, dialkylamino, alkylamido, dialkylamido, cycloalkoxy, cycloalkylthio, cycloalkylcarbonyl, cycloalkoxycarbonyl, cycloalkylcarboxy, cycloalkylamino, di(cycloalkyl)amino, (cycloalkyl)(alkyl)amino, cycloalkylamido, di(cycloalkyl)amido, (cycloalkyl)(alkyl)amido, aryloxy, arylthio, arylcarbonyl, aryloxycarbonyl, arylcarboxy, arylamino, diarylamino, (aryl)(alkyl)amino, arylamido, aralkoxy, aralkylthio, aralkylcarbonyl, aralkoxycarbonyl, aralkylcarboxy, aralkylamino, diaralkylamino, (aralkyl)(alkyl)amino, heterocycl, trialkylsilyl, and trialkylsilyloxy, each of which may be further substituted with one or more halogens, alkyl groups (except for alkyl substituents on R<sup>1</sup>) and/or alkoxy groups.

28. (Currently Amended; Withdrawn) The ~~compound~~ material of Claim 27, wherein R<sup>1</sup> is C<sub>4</sub>-C<sub>20</sub> alkyl which may be substituted one or more times with a halogen, a C<sub>1</sub>-C<sub>6</sub> alkoxy, C<sub>3</sub>-C<sub>8</sub> cycloalkyl, phenyl and/or C<sub>7</sub>-C<sub>20</sub> aralkyl, each of which (except for halogen) may be further substituted with one or more halogens, C<sub>1</sub>-C<sub>6</sub> alkyl groups and/or C<sub>1</sub>-C<sub>6</sub> alkoxy groups.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

29. (Currently Amended; Withdrawn) The ~~compound material~~ of Claim 21, wherein R<sup>2</sup> is selected from the group consisting of alkylene, alkyleneoxy, alkyleneoxyalkylene, alkyleneoxyalkyleneoxy, alkylenthio, alkylenthioalkylene, alkylene carbonyl, alkyleneoxycarbonyl, alkylene carboxy, alkylene amino, alkylene(alkyl)amino, alkylene(alkyl)aminoalkylene, alkyleneamido, alkylene(alkyl)amido, cycloalkylene, cycloalkyleneoxy, cycloalkylenethio, cycloalkylenecarbonyl, cycloalkyleneoxycarbonyl, cycloalkylenecarboxy, cycloalkyleneamino, (cycloalkylene)(alkyl)amino, cycloalkyleneamido, (cycloalkylene)(alkyl)amido, arylene, alkylene-arylene, alkylene-arylene-alkylene, aryleneoxy, alkyleneoxyarylene, alkylene-aryleneoxy, aryleneoxyalkylene, arylenthio, alkylene-arylenethio, arylenthioalkylene, arylene carbonyl, alkylene-arylenecarbonyl, aryleneoxycarbonyl, alkylene-aryleneoxy carbonyl, arylene carboxy, alkylene-arylenecarboxy, arylene amino, alkylene-aryleneamino, arylene(aryl)-amino, alkylene-arylene(aryl)amino, arylene(alkyl)amino, alkylene-arylene(alkyl)amino, alkylene(aryl)amino, aryleneamido, aralkylene, aralkyleneoxy, (alkylene)aralkyleneoxy, aralkylenethio, aralkylenecarbonyl, aralkyleneoxycarbonyl, aralkylenecarboxy, aralkyleneamino, aralkylene(aryl)amino, (aralkylene)(alkyl)amino, (alkylene)(aralkyl)amino, heterocyclene, alkylene-heterocyclene, and alkylene-heterocyclene-alkylene, each of which may be further substituted with one or more halogens, alkyl groups (except where R<sup>2</sup> = alkylene), alkoxy groups, trialkylsilyl, and/or trialkylsilyloxy groups.
30. (Currently Amended; Withdrawn) The ~~compound material~~ of Claim 29, wherein R<sup>2</sup> is selected from the group consisting of alkylene, alkylene substituted with one or more halogens and/or alkoxy groups, alkyleneoxy, alkyleneoxyalkylene, alkyleneoxyalkyleneoxy, alkylene(alkyl)amino, cycloalkylene, arylene, arylene substituted with one or more halogens, alkyl groups and/or alkoxy groups, aryleneoxy, arylenthio, arylene(alkyl)amino, aralkylene, (alkylene)aralkylene, and aralkylene(alkyl)amino.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

31. (Currently Amended; Withdrawn) The ~~compound material~~ of Claim 30, wherein R<sup>2</sup> is selected from the group consisting of C<sub>4</sub>-C<sub>20</sub>, branched or unbranched, saturated or unsaturated alkylene groups; C<sub>7</sub>-C<sub>17</sub>, branched or unbranched, substituted or unsubstituted aralkylene groups; C<sub>4</sub>-C<sub>20</sub>, branched or unbranched, saturated or unsaturated alkyleneoxy groups; and C<sub>4</sub>-C<sub>20</sub>, branched or unbranched, saturated or unsaturated alkylene thio groups.
32. (Currently Amended; Withdrawn) The ~~compound material~~ of Claim 21, wherein Y is reactive with a photochemically generated species and which, after reacting with said photochemically generated species, materially changes the solubility characteristics of said material in said developer.
33. (Currently Amended; Withdrawn) The ~~compound material~~ of Claim 32, wherein Y is selected from the group consisting of a carbon-carbon double bond, an epoxide, an oxirane, an aziridine, and a phenol.
34. (Currently Amended; Withdrawn) The ~~compound material~~ of Claim 32, wherein Y is selected from the group consisting of a vinyl group, a vinylidene group, an epoxide, a carbonate, a carbamate and a phenol.
35. (Currently Amended; Withdrawn) The ~~compound material~~ of Claim 34, wherein Y comprises a vinyl group or a vinylidene group substituted with a halogen, a C<sub>1</sub>-C<sub>6</sub> alkyl group, a C<sub>1</sub>-C<sub>6</sub> alkoxy group, a phenyl group, a phenyl group substituted with one or more halogens, C<sub>1</sub>-C<sub>6</sub> alkyl groups, C<sub>1</sub>-C<sub>6</sub> alkoxy groups and/or di-(C<sub>1</sub>-C<sub>6</sub> alkyl)amino groups, a -C(=O)-C<sub>1</sub>-C<sub>6</sub> alkyl group, a -C(=O)-C<sub>1</sub>-C<sub>6</sub> alkoxy group, or a cyano group.
36. (Currently Amended; Withdrawn) The ~~compound material~~ of Claim 21, wherein X<sup>1</sup> and X<sup>2</sup> are independently a chalcogen, a carboxylate group, a carboxylic acid group, a

Atty. Docket No. KOV-012  
Serial No: 10/749,876

thiocarboxylate group, a thiocarboxylic acid group, an alkylene group,  $NR^5_u$  (where  $u$  is from 0 to 2 and each  $R^5$  is independently H or a  $C_1$ - $C_6$  alkyl group),  $S(O)_x$  (where  $x$  is from 1 to 3),  $PR^7_v$  (where  $v$  is from 0 to 3 and each  $R^7$  is independently H, a  $C_1$ - $C_6$  alkyl group or a  $C_6$ - $C_{10}$  aryl group which may be substituted with one or more halogen,  $C_1$ - $C_4$  alkyl,  $C_1$ - $C_4$  alkoxy, or di- $C_1$ - $C_4$  alkylamino groups) or  $P(O)_y(R^6)_z$  (where  $y$  is from 1 to 3,  $z$  is 1 or 2, and each  $R^6$  is independently H, phenyl or a  $C_1$ - $C_6$  alkyl group).

37. (Currently Amended; Withdrawn) The ~~compound~~ material of Claim 36, wherein  $X^1$  and  $X^2$  are independently at least one nanoparticle-binding member is selected from the group consisting of O, S, a carboxylate, a carboxylic acid group, and a - $CH_2CH_2$ - group.
38. (Original; Withdrawn) A radiation definable ink, comprising:
  - a) the material of Claim 1; and
  - b) a solvent in which said material is soluble.
39. (Original; Withdrawn) The ink of Claim 38, further comprising a source of said photochemically generated species.
40. (Original; Withdrawn) The ink of Claim 39, wherein said source of said photochemically generated species is selected from the group consisting of azides, photogenerated acid sources, photogenerated radical sources, carbonates, carbamates, and quinones.
41. (Original; Withdrawn) The ink of Claim 39, wherein said source of said photochemically generated species is an azide, and said group that is reactive with said photochemically generated species comprises said carbon-carbon double bond.
42. (Original; Withdrawn) The ink of Claim 39, wherein said source of said photochemically generated species is a photogenerated acid source, and said group that is reactive with

Atty. Docket No. KOV-012  
Serial No: 10/749,876

said photochemically generated species is selected from the group consisting of an epoxide, an oxirane, an aziridine, and an activated carbon-carbon double bond.

43. (Original; Withdrawn) The ink of Claim 39, wherein said source of said photochemically generated species is a photogenerated radical source, and said group that is reactive with said photochemically generated species comprises an acrylate.
44. (Original; Withdrawn) The ink of Claim 38, wherein said ligands contain said photochemically reactive group, and said photochemically reactive group comprises a carbonate and/or a carbamate.
45. (Original; Withdrawn) The ink of Claim 38, wherein said photoreactive group comprises a quinone, and said ligand comprises a phenol.
46. (Original; Withdrawn) The ink of Claim 38, wherein said material is present in said ink in a percentage by weight of from 0.1% to 50%.
47. (Original; Withdrawn) The ink of Claim 38, wherein said solvent is selected from the group consisting of alkanes, alkenes, halogenated alkanes, halogenated alkenes, arenes, substituted arenes, alcohols, ethers, cyclic ethers, aliphatic ketones, aliphatic esters, aliphatic amides and aliphatic sulfoxides.
48. (Original; Withdrawn) The ink of Claim 47, wherein said solvent is selected from the group consisting of C<sub>6</sub>-C<sub>20</sub> alkanes, C<sub>6</sub>-C<sub>20</sub> alkenes, benzene which may be substituted with from 1 to 3 C<sub>1</sub>-C<sub>4</sub> alkyl groups, C<sub>1</sub>-C<sub>6</sub> aliphatic alcohols, C<sub>4</sub>-C<sub>20</sub> ethers, C<sub>4</sub>-C<sub>20</sub> polyethers, C<sub>4</sub>-C<sub>10</sub> aliphatic ketones, and C<sub>1</sub>-C<sub>6</sub> aliphatic esters of C<sub>2</sub>-C<sub>12</sub> aliphatic carboxylic acids that may be substituted with from 1 to 3 halogen atoms or a C<sub>1</sub>-C<sub>4</sub> alkoxy group.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

49. (Original; Withdrawn) The ink of Claim 48, wherein said solvent comprises propylene glycol methyl ether acetate or ethyl ethoxypropionate.
50. (Original; Withdrawn) The ink of Claim 47, further comprising one or more additives selected from the group consisting of a tension reducing agent, a surfactant, a thickening agent, and an adhesion promoter.
51. (Original; Withdrawn) The ink of Claim 50, further comprising said adhesion promoter.
52. (Original; Withdrawn) The ink of Claim 51, wherein said adhesion promoter comprises a C<sub>6</sub>-C<sub>20</sub>, branched or unbranched, mono- or polyunsaturated alkene; a C<sub>8</sub>-C<sub>18</sub>, branched or unbranched, substituted or unsubstituted mono- or polyunsaturated aralkene; a C<sub>4</sub>-C<sub>20</sub>, branched or unbranched, mono- or polyunsaturated alkenoic acid; a C<sub>1</sub>-C<sub>20</sub> branched or unbranched aliphatic alcohol ester of a C<sub>2</sub>-C<sub>20</sub>, branched or unbranched aliphatic acid, wherein at least one of said aliphatic alcohol and said aliphatic acid contains at least 3 carbon atoms and at least one site of unsaturation; and/or a C<sub>4</sub>-C<sub>20</sub>, branched or unbranched, mono- or polyunsaturated aliphatic alcohol or aliphatic mercaptan.
53. (Currently Amended; Withdrawn) A radiation definable ink, comprising:
  - a) the compound material of Claim 21; and
  - b) a solvent in which said compound is soluble.
54. (Original; Withdrawn) The ink of Claim 53, further comprising a source of said photochemically generated species.
55. (Original; Withdrawn) The ink of Claim 54, wherein said source of said photochemically generated species is selected from the group consisting of azides, photogenerated acid sources, photogenerated radical sources and quinones.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

56. (Original; Withdrawn) The ink of Claim 54, wherein said source of said photochemically generated species is an azide, and said group that is reactive with said photochemically generated species comprises said carbon-carbon double bond.
57. (Currently Amended; Withdrawn) The ink of Claim 54, wherein said source of said photochemically generated species comprises is a photogenerated acid source, and said group that is reactive with said photochemically generated species is selected from the group consisting of an epoxide, an oxirane, an aziridine, and an activated carbon-carbon double bond.
58. (Original; Withdrawn) The ink of Claim 54, wherein said source of said photochemically generated species is comprises a photogenerated radical source, and said group that is reactive with said photochemically generated species comprises an acrylate.
59. (Original; Withdrawn) The ink of Claim 53, wherein said ligands contain said photochemically reactive group, and said photochemically reactive group comprises a carbonate and/or a carbamate.
60. (Original; Withdrawn) The ink of Claim 53, wherein said compound is present in said composition in a percentage by weight of from 0.1% to 50%.
61. (Original; Withdrawn) The ink of Claim 53, further comprising one or more additives selected from the group consisting of a tension reducing agent, a surfactant, a thickening agent, and an adhesion promoter.
62. (Original; Withdrawn) The ink of Claim 61, further comprising said adhesion promoter.
63. (Original; Withdrawn) The ink of Claim 62, wherein said binder comprises a C<sub>6</sub>-C<sub>20</sub>, branched or unbranched, mono- or polyunsaturated alkene; a C<sub>8</sub>-C<sub>18</sub>, branched or

Atty. Docket No. KOV-012  
Serial No: 10/749,876

unbranched, substituted or unsubstituted mono- or polyunsaturated aralkene; a C<sub>4</sub>-C<sub>20</sub>, branched or unbranched, mono- or polyunsaturated alkenoic acid; a C<sub>1</sub>-C<sub>20</sub> branched or unbranched aliphatic alcohol ester of a C<sub>2</sub>-C<sub>20</sub>, branched or unbranched aliphatic acid, wherein at least one of said aliphatic alcohol and said aliphatic acid contains at least 3 carbon atoms and at least one site of unsaturation; and/or a C<sub>4</sub>-C<sub>20</sub>, branched or unbranched, mono- or polyunsaturated aliphatic alcohol or aliphatic mercaptan.

64. (Currently Amended; Withdrawn) A method of making the material of Claim 1, comprising the steps of:
  - a) reacting said nanoparticles of said an electronically functional substance with one or more non-ligated compounds corresponding to said ligands having said photoreactive group or said group that is reactive with said photochemically generated species; and
  - b) isolating and/or purifying said material.
65. (Original; Withdrawn) The method of Claim 64, wherein said nanoparticles of an electronically functional substance contain ligands not having said photoreactive group or said group that is reactive with said photochemically generated species.
66. (Original; Withdrawn) The method of Claim 65, wherein said reacting comprises exchanging said non-ligated compounds for said ligands not having said photoreactive group or said group that is reactive with said photochemically generated species on said nanoparticles.
67. (Original; Withdrawn) The method of Claim 65, wherein said reacting comprises mixing (1) nanoparticles of an said electronically functional substance containing said ligands not having said photoreactive group or said group that is reactive with said photochemically generated species bound thereto and (2) said non-ligated compounds in a solvent for a length of time sufficient to exchange at least a portion of the non-ligated

Atty. Docket No. KOV-012  
Serial No: 10/749,876

compounds for said ligands not having said photoreactive group or said group that is reactive with said photochemically generated species bound thereto.

68. (Original; Withdrawn) The method of Claim 67, wherein said ligands not having said photoreactive group or said group that is reactive with said photochemically generated species bound thereto are present in an excess molar amount with respect to said nanoparticles.
69. (Original; Withdrawn) The method of Claim 65, further comprising mixing a Lewis base with said nanoparticles having bound thereto ligands not containing said group that is reactive with said photochemically generated species and said non-ligated compounds to promote a ligand exchange.
70. (Original; Withdrawn) A method of making the material of Claim 1,
  - a) mixing (i) said nanoparticles having bound thereto ligands not containing a group that is reactive with said photochemically generated species with (ii) one or more non-ligated compounds corresponding to said ligands containing a group that is reactive with said photochemically generated species, said non-ligated compounds forming a van der Waals complex or micelle with said ligands bound to said nanoparticles and not containing a group that is reactive with said photochemically generated species; and
  - b) isolating and/or purifying said material.
71. (Original; Withdrawn) The method of Claim 70, wherein said nanoparticles having bound thereto ligands not containing said group that is reactive with said photochemically generated species comprises (i) a nanoparticle core of said electronically functional substance, and (ii) long-chain alkyl groups covalently bound thereto.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

72. (Original; Withdrawn) The method of Claim 70, wherein said non-ligated compounds comprise a long-chain alkyl group covalently bound to said group that is reactive with said photochemically generated species.
73. (Original; Withdrawn) The method of Claim 70, wherein said mixing step is conducted in a polar solvent.
74. (Currently Amended; Withdrawn) A method of making the compound material of Claim 21, comprising the steps of
  - a) mixing nanoparticles of the formula  $NP(X^1-R^1)_k$ , where k is an integer greater than 1 and where NP,  $X^1$  and  $R^1$  are as defined in Claim 21, with a molar excess of a compound of the formula  $HX^2-R^2-Y$  or a salt thereof, where  $X^2$ ,  $R^2$  and Y are as defined in Claim 21, in a reaction mixture; and
  - b) isolating and/or purifying said compound of the formula (1) from said reaction mixture.
75. (Original; Withdrawn) The method of Claim 74, further comprising mixing a Lewis base with said nanoparticles of the formula  $NP(X^1-R^1)_k$  and said compound of the formula  $HX^2-R^2-Y$  to promote a ligand exchange.
76. (Original; Withdrawn) The method of Claim 74, wherein said compound of the formula  $H-X^2-R^2-Y$  or a salt thereof is present in at least 4 times the molar amount of said nanoparticles.
77. (Original; Withdrawn) The method of Claim 74, wherein  $R^1-X^1$  is  $R^1-C(=O)-O-$ , and  $H-X^2-R^2-Y$  is  $H-S-R^2-Y$ .
78. (Currently Amended; Withdrawn) A method of making the material compound of Claim 21, comprising

Atty. Docket No. KOV-012  
Serial No: 10/749,876

- a) either:
  - i) mixing nanoparticles of the formula  $(R^1-X^1)_m NP(X^2-R^3-Z)_n$ , where  $R^3$  is any  $R^2$  group, Z is a leaving group or electrophile, and NP, m, n,  $X^1$ ,  $X^2$ ,  $R^1$  and  $R^2$  are as defined in Claim 21, with a compound of the formula H-Y, H-Nu-Y, H-Nu- $R^4$ -Y or a salt of such compounds, where Nu is a conventional nucleophile and  $R^4$  is  $R^2$  minus  $R^3$ , and Y is as defined in Claim 21, in a reaction mixture, or
  - ii) mixing nanoparticles of the formula  $(R^1-X^1)_m NP(X^2-R^3-Nu-H)_n$  or a salt thereof with a compound of the formula Z-Y or Z- $R^4$ -Y in a reaction mixture, where  $R^1$ ,  $R^3$ ,  $R^4$ , NP, m, n,  $X^1$ ,  $X^2$ , Nu, Y and Z are as defined above; and
- b) isolating and/or purifying said compound of the formula (1) from said reaction mixture.

79. (Original; Withdrawn) The method of Claim 78, wherein said nanoparticles have the formula  $(R^1-X^1)_m NP(X^2-R^3-OH)_n$ ,  $(R^1-X^1)_m NP(X^2-R^3-COOR^5)_n$ ,  $(R^1-X^1)_m NP(X^2-R^3-NZ_2)_n$ , or  $(R^1-X^1)_m NP(X^2-R^3-SH)_n$ ,  $X^2$  is independently a carboxylate, a carboxylic acid,  $-NR^8_2$ ,  $-N^+R^8_3$ , an oxygen atom or sulfur atom,  $R^8$  is H or alkyl, and  $R^5$  is H or an ester protecting group.

80. (Original; Withdrawn) The method of Claim 78, wherein said mixing comprising mixing nanoparticles of the formula  $(R^1-X^1)_m NP(X^2-R^3-Z)_n$ , where NP consists essentially of a metal and  $X^2$  is a carboxylate, a carboxylic acid or S, with said compound of the formula H-Nu-Y, H-Nu- $R^4$ -Y or a salt thereof, where NuH is  $-NHR^8$ , OH or SH (except that NuH is OH when  $X^2$  is said carboxylate or carboxylic acid) and  $R^8$  is H or alkyl.

81. (Original; Withdrawn) The method of Claim 78, wherein NP consists essentially of silicon or a silicon-germanium mixture,  $X^2$  is alkylene or O, and said compound of the

Atty. Docket No. KOV-012  
Serial No: 10/749,876

formula H-Y, H-Nu-Y, or H-Nu-R<sup>4</sup>-Y is either H-Nu-Y or H-Nu-R<sup>4</sup>-Y, where H-Nu is COOH, NHR<sup>8</sup> or SH, and R<sup>8</sup> is H or alkyl.

82. (Original; Withdrawn) The method of Claim 78, comprising mixing nanoparticles of the formula (R<sup>1</sup>-X<sup>1</sup>)<sub>m</sub>NP(X<sup>2</sup>-R<sup>3</sup>-Z)<sub>n</sub> with a compound of the formula H-Y or a salt thereof.
83. (Original; Withdrawn) The method of Claim 78, wherein Y is a cyanide, azide, hydroxide or sulfide anion.
84. (Original; Withdrawn) The method of Claim 78, comprising mixing nanoparticles of the formula (R<sup>1</sup>-X<sup>1</sup>)<sub>m</sub>NP(X<sup>2</sup>-R<sup>3</sup>-Nu-H)<sub>n</sub> or a salt thereof with a compound of the formula Z-Y or Z-R<sup>4</sup>-Y.
85. (Original; Withdrawn) The method of Claim 84, wherein Nu comprises a chalcogenide atom, a phenolate anion, an amine, a carboxylate or an aryl group, and said compound of the formula Z-Y or Z-R<sup>4</sup>-Y comprises an aliphatic carboxylic acid anhydride, an allyl halide, or an aliphatic acyl chloride.
86. (Currently Amended; Withdrawn) A method of making the compound material of Claim 21, comprising the steps of
  - a) reacting nanoparticles of the formula (R<sup>1</sup>-X<sup>1</sup>)<sub>m</sub>NP(X<sup>1</sup>-R<sup>3</sup>-(CR=CR'R'')<sub>k</sub>), where k is an integer greater than 1, NP, R<sup>1</sup> and X<sup>1</sup> are as defined in Claim 21, R<sup>3</sup> is R<sup>2</sup> or a precursor thereof, and R, R' and R'' are independently H, C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, mono- or di-C<sub>1</sub>-C<sub>6</sub> alkyl amino, a cyclic amino group, C<sub>6</sub>-C<sub>10</sub> aryl (which may be substituted one or more times with C<sub>1</sub>-C<sub>6</sub> alkyl, C<sub>2</sub>-C<sub>6</sub> alkenyl, C<sub>1</sub>-C<sub>6</sub> alkoxy, mono- or di-C<sub>1</sub>-C<sub>6</sub> amino or halogen); -C(=O)O-C<sub>1</sub>-C<sub>6</sub> alkyl or -C(=O)C<sub>1</sub>-C<sub>6</sub> alkyl, with an epoxidizing agent or source of Y<sup>+</sup>, Y<sup>-</sup> or Y<sup>·</sup>; and

Atty. Docket No. KOV-012  
Serial No: 10/749,876

- b) isolating and/or purifying said compound of the formula (1) from said reaction mixture.

87. (Original; Withdrawn) The method of Claim 86, wherein R, R' and R" are independently H or C<sub>1</sub>-C<sub>6</sub> alkyl.

88. (Original; Withdrawn) The method of Claim 86, wherein said reacting is with said epoxidizing agent.

89. (Original; Withdrawn) The method of Claim 86, wherein said reacting is with said Y<sup>+</sup> source and comprises electrophilically adding Y from Z-Y to the CR=CR'R" group.

90. (Original; Withdrawn) The method of Claim 86, wherein said reacting is with said Y<sup>-</sup> source and comprises electrophilically adding HY to the CR=CR'R" group.

91. (Original; Withdrawn) The method of Claim 86, wherein said reacting is with said Y<sup>·</sup> source and comprises radical addition of Y from HY or Y<sub>2</sub> to the CR=CR'R" group.

92. (Original; Withdrawn) A method of making an electronically functional thin film, comprising the steps of:

- a) irradiating the ink of Claim 38 to form an irradiated composition; and
- b) curing said irradiated composition to form said electronically functional thin film.

93. (Original; Withdrawn) The method of Claim 92, further comprising, after said irradiating step and before said curing step, the step of developing said irradiated composition to form a patterned thin film.

94. (Original; Withdrawn) The method of Claim 93, wherein said irradiating step comprises selectively irradiating portions of said composition, and said developing step comprises

Atty. Docket No. KOV-012  
Serial No: 10/749,876

removing either irradiated or non-irradiated portions of said layer to form said patterned thin film.

95. (Original; Withdrawn) The method of Claim 94, wherein said selectively irradiating substep comprises (i) positioning at least one of said substrate and a mask such that said portions can be selectively irradiated and said non-irradiated portions cannot be irradiated, and (ii) irradiating said layer with ultraviolet light through said mask.
96. (Currently Amended; Withdrawn) The method of Claim 92, wherein said composition comprises metal, ~~dielectric, phosphor and/or semiconductor~~ nanoparticles having passivation thereon and/or containing ligands not having a (photo)reactive group bound thereto.
97. (Original; Withdrawn) The method of Claim 96, wherein said nanoparticles comprise metal nanoparticles.
98. (Original; Withdrawn) The method of Claim 93, wherein said curing step comprises sintering said developed film to form a patterned electronically functional thin film.
99. (Currently Amended; Withdrawn) The method of Claim 9398, wherein said curing step comprises heating said composition to a temperature of at least about 100 °C for a period of time sufficient to remove substantially all of said ligand(s).
100. (Original; Withdrawn) The method of Claim 99, wherein said curing temperature is at least about 200 °C.
101. (Original; Withdrawn) The method of Claim 100, wherein said curing temperature is at least about 300 °C.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

102. (Original; Withdrawn) The method of Claim 101, wherein said curing temperature is at least about 400 °C.
103. (Original; Withdrawn) The method of Claim 99, further comprising heating said electronically functional thin film to a temperature of at least about 200 °C in the presence of a reducing atmosphere to passivate said electronically functional thin film.
104. (Original; Withdrawn) The method of Claim 103, wherein said heating temperature is at least about 300 °C.
105. (Original; Withdrawn) The method of Claim 92, further comprising depositing said composition on a substrate.
106. (Original; Withdrawn) The method of Claim 105, wherein said depositing comprises inkjetting, spin coating, dip coating, meniscus, extrusion or spray coating a solution, emulsion or suspension of said composition on said substrate.
107. (Original; Withdrawn) The method of Claim 92, wherein said curing step further comprises placing said substrate into a chamber, and evacuating said chamber.
108. (Original; Withdrawn) The method of Claim 107, wherein said curing step further comprises passing an inert and/or reducing gas into said chamber.
109. (Original; Withdrawn) The method of Claim 93, wherein said patterned thin film comprises a two-dimensional array of lines having a width of from 100 nm to 100 µm.
110. (Original; Withdrawn) The method of Claim 109, wherein said lines have an inter-line spacing of from 100 nm to 100 µm.

Atty. Docket No. KOV-012  
Serial No: 10/749,876

111. (Original; Withdrawn) The method of Claim 110, wherein said lines have a length of from 1  $\mu\text{m}$  to 5000  $\mu\text{m}$ .

112. (Original; Withdrawn) The method of Claim 109, wherein said lines have a thickness of from 0.01  $\mu\text{m}$  to 100  $\mu\text{m}$ .

113-123. (Canceled)